UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

CAMBRIDGE.—At Emmanuel College, the exhibition of 50*l*., tenable for two years, offered to an advanced student commencing residence this October, has been awarded to L. J. Russell, Glasgow University. Other exhibitions of 30*l*., tenable for two years, have been awarded to W. T. Gordon, Edinburgh University, and to A. Ll. Hughes, Liverpool University.

OXFORD.—The jubilee of the inception of the University museum is to be commemorated to-day, October 8, by a meeting in the Sheldonian Theatre and a conversazione at the museum. A distinguished company has accepted invitations to be present. The foundation-stone of the building was laid on June 20, 1855, and the work was completed in October, 1858. Its erection represents the result of a movement for the provision of "an edifice within the precincts of the University for the better display of material illustrative of the facts and laws of the natural world." One of the aims of the promoters of the scheme was to gather together various branches of sciences "for mutual aid, and easy interchange of reference and comparison." The museum has thus connected with it departments of medicine and public health, comparative anatomy, physiology, human anatomy, zoology, experimental philosophy, physics, chemistry, geology, mineralogy, ethnography, and pathology. Teaching began in two departments fifty years ago, and the present museum represents the outcome of that beginning.

In connection with the celebration of the jubilee honorary degrees are to be conferred upon Prof. Arrhenius and Dr. A. G. Vernon Harcourt, F.R.S. At the reception in the afternoon Dr. Harcourt will give a short account of the establishment and work of the museum, and a bust of Prof. W. F. R. Weldon, who died in 1906, will be unveiled.

MR. JACOB SASSOON has given ten lakhs of rupees (66,000*l*.) to establish a central college of science in Bombay.

THE Salters' Company has voted 100*l*. per annum for a period of three years to the cancer research laboratories of the Middlesex Hospital as a research scholarship.

THE distribution of prizes, diplomas, &c., at the South-Eastern Agricultural College, Wye, will be made on October 21, when Sir Horace Plunkett, F.R.S., will deliver the inaugural address.

THE Pereira medal of the Pharmaceutical Society, awarded annually for high proficiency in *materia medica*, botany, and chemistry, was presented to Miss Gertrude H. Wren on September 30, this being the first occasion upon which the prize was received by a woman.

THE Child Study Society of London will resume its meetings for lectures and discussions on October 15, at 8 p.m., in the Parkes Museum, Margaret Street, London, W. At the opening meeting Dr. C. W. Kimmins will deliver an address on the relation of the curriculum to the development of the child. At subsequent meetings Miss Alice Ravenhill will describe some results of an investigation into hours of sleep among English elementary-school children; Dr. G. Eric Pritchard will lecture on the physiology of the child; Dr. F. H. Hayward will deal with education and recent studies in heredity; and Dr. James Kerr will take for his subject the educational revolution and some hints for the future.

THE Board of Education has issued the following list of successful candidates for Royal exhibitions, national scholarships, and free studentships (science), 1908:—*Royal Exhibitions:* A. Riddle, Portsmouth; T. J. Hornblower, Southsea; A. H. Gabb, Swindon; A. E. Stone, Portsmouth; F. Morris, Portsmouth; S. B. Hamilton, Halifax; A. H. Barrett, Southsea. *National Scholarships for Mechanics (Group A):* B. C. Carter, Southsea; A. J. White, Southsea; H. H. German, Devonport; W. F. Boryer, Portsmouth; H. Mawson, Hunslet, Leeds. *Free Studentships for Mechanics (Group A):* G. W. Bird, Plymouth; H. G. Stephens, Leicester. *National Scholarships for Physics (Group B):* J. Lamb, Gateshead; H. Billett, Swindon; F. C. Hobbs, Bristol; R. Ecker, Norwich; T. W. Johnstone, Neyland, Pembrokeshire. *Free Studentships for Physics (Group B):* P. H. S. Kempton, Swindon; W. Jevons, Smethwick. *National Scholarships for Chemistry (Group C):* W. A. C. Newman, Leeds; E. W. Yeoman, Southampton; F. Hargreaves, Burnley; L. D. Goldsmith, London; E. Jobling, Hull; E. O. Jones, Leeds. *Free Studentship for Chemistry (Group C):* L. Owen, Trefriw, Carnarvonshire. *National Scholarships for Biology (Group D):* E. Hill, Bradford; H. Wormald, Wakefield; T. E. Herbert, London. *Free Studentship for Biology (Group D):* E. T. Halnan, London. *National Scholarships for Geology (Group E):* H. Hart, Camborne; A. Sharples, Burnley; J. W. Chaloner, Burnley.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, Received July 31.—"On Helium in Saline Minerals, and its Probable Connection with Potassium." By the Hon. R. J. **Strutt**, F.R.S.

In a former paper (Roy. Soc. Proc., A, vol. lxxx., p. 592) the author mentioned that saline minerals were often comparatively free from contamination with radio-active material of the uranium-radium series. Accordingly, they afford special opportunities of testing whether or not helium is generated by the other elements present, namely, sodium, potassium, magnesium, calcium, sulphur, chlorine, oxygen, hydrogen. In this paper determinations are given of helium and radium in some of the saline minerals of Stassfurt.

Helium was liberated by solution of the mineral in water, and was suitably purified. Uranium was determined in the same solution, by the usual method of boiling out the radium emanation generated in a definite period.

The results were as follows:—

Mineral	Composition	Helium, c.mm. per 100 grs.	Grams uranium oxide (U_3O_8) per 100 grs.	Helium, c.c. per gr. U_3O_8
Rock salt .	$NaCl$	0·0233	$7\ 1 \times 10^{-6}$	3·3
Sylvine . .	KCl	0·55	$2·15 \times 10^{-6}$	256
Carnallite .	$KMgCl_3 6H_2O$	0·151	$3·23 \times 10^{-6}$	47
Kieserite .	$MgSO_4 H_2O$	0·0179	$6·47 \times 10^{-5}$	0·277

Some other salts were also examined qualitatively.

In none of them was the quantity of helium at all comparable with what was observed in carnallite or sylvine, though D_3 could generally be seen.

Returning to the quantitative experiments, it is noticeable that very high ratios of helium to uranium oxide are met with in these two minerals.

It seems altogether improbable that the minute traces of uranium and radium present can account for so much helium. On the other hand, the helium in rock salt is very much of the order to be expected from its geological age if it originates from the uranium family of radio-active bodies.

In view of Campbell and Wood's observations on the radio-activity of potassium (Camb. Phil. Soc. Proc., vol. xix., p. 15), the author is disposed to regard that element as the source.

Received July 28.—"On the Accumulation of Helium in Geological Time." By the Hon. R. J. **Strutt**, F.R.S.

In a former paper (Roy. Soc. Proc., A, vol. lxxx., 1908, p. 572) the author gave an account of experiments on the presence of helium in a variety of the common minerals of the earth's crust. The conclusion arrived at was that the quantity of helium is, in general, determined by the traces of radio-active elements present. The minerals investigated were mostly of Palæozoic age, and little attention was paid to the effect of geological age on helium content. If, however, the accepted theory of the progressive accumulation of helium in minerals by radio-active change is correct, it is evident that geological age must be all-

important. In the present paper the subject is considered from that point of view.

There is some difficulty in finding suitable material for comparing the helium content of minerals with their geological age. The author has been fortunate in discovering that phosphatic nodules (the so-called coprolites) and phosphatised bones are extremely rich in radio-active constituents, sometimes containing fifty times as much radium as the generality of rocks. These nodules and bones are found in a great variety of strata, from the Pliocene downwards. The nodules frequently contain, or consist of, fossils characteristic of the stratum to which they belong, or of one very little earlier; thus their age is well defined. The same remark applies still more to the mineralised bones. There is no reason to doubt that the radio-active material was introduced into the bones by infiltration at the time that they became phosphatised, and from that epoch the accumulation of helium must be dated.

In these experiments the author has extracted the helium by solution of the powdered substance in hydrochloric acid. The action takes place quite readily.

Radium was determined by the methods described in earlier papers. The solution obtained in extracting helium was usually employed for the radium determination.

The uranium oxide percentage was calculated from the radium observations by standardisation with a uranium mineral.

The results may be tabulated as follows:—

Material	Locality	Geological Horizon	Helium, c.mm. per 100 grams	U_3O_8, grams per 100 grams	Helium, c.c. per gram of U_3O_8
Phosphatised shark's teeth ...	Florida	Pliocene	0·174	$2{\cdot}48 \times 10^{-2}$	0·0070
Phosphatised Cetacean bones ...	Felixstowe	Pliocene Red Crag	0·158	$1{\cdot}55 \times 10^{-2}$	0·0102
Phosphatic nodules	,, ...	,, ,, ,, ...	0·098	$4{\cdot}78 \times 10^{-3}$	0·0205
,, ,, ...	Cambridge	Upper Greensand	3·03	$1{\cdot}08 \times 10^{-2}$	0·281
,, ,, ...	Potton, Bedfordshire ...	Lower Greensand	2·10	$5{\cdot}83 \times 10^{-3}$	0·360
Phosphatised Saurian bones ...	Ely	Kimmeridge Clay	<0·365	$3{\cdot}28 \times 10^{-3}$	<0·111
Phosphatic nodules	Knapwell, Cambs.	Base of Kimmeridge Clay .	<0·675	$7{\cdot}20 \times 10^{-3}$	<0·094
Phosphatised Saurian bones ...	Whittlesea	Oxford Clay	<0·51	$9{\cdot}15 \times 10^{-4}$	<0·558
Phosphatic bone fragments ...	Lyme Regis	Rhætic bone bed	<0·22	$2{\cdot}15 \times 10^{-3}$	<0·102
Hæmatite	Frizington, by Carnforth, Cumberland	Above Carboniferous Limestone	16·5	$1{\cdot}28 \times 10^{-3}$	12·9
Phosphatic nodules	Near Bala	Bala beds	15·3	$3{\cdot}23 \times 10^{-3}$	4·74
Phosphatic limestone	Chirbury, Shropshire ...	Llandeilo Limestone... ...	5·6	$7{\cdot}90 \times 10^{-4}$	7·10
Phosphatic nodules	Cailleach Head, Loch Broom	Torridon Sandstone	0·83	$9\ 9 \times 10^{-4}$	0·84

It will be at once noticed that the order of stratigraphical position is not accurately followed. For example, the phosphatic nodules and bones from the Kimmeridge Clay do not show so high a helium ratio as those from the Lower or Upper Greensand, though they are geologically older than either. At the same time it will be noticed that helium ratios approaching 12, such as are common in the mineral veins of Carboniferous age in Cornwall, are not met with in the younger strata.[1] The facts are most easily explained by supposing that the retention of helium has been often, if not always, imperfect.

One point remains to be referred to. If thorium were present in any of these materials we might expect it to have a disturbing influence, as an independent source of helium. The most searching experiments the author has been able to make have only suggested a faint suspicion of its presence in the phosphatic nodules and bones. It can contribute nothing appreciable to their activity. The same applies to Cumberland hæmatite; in this case the results were still more distinctly negative.

The chief interest of the present results is in their application to the measurement of geological time. For this application we require to know the rate at which helium is produced from 1 gram of uranium with the equilibrium quantity of all the other products of the series.

Prof. Rutherford has kindly communicated to the author his latest estimate. It is that 316 cubic mm. of helium are produced per gram of radium per annum. This is deduced on the following assumptions:—

(1) The number of helium atoms produced is equal to the number of α particles emitted.

(2) For every four α particles emitted by radium with its immediate products, two are emitted by uranium, one by ionium, and one by polonium.

The author does not enter on any discussion of the validity of these suppositions, beyond remarking that there are no definite grounds at present for deciding whether or not helium is liberated in the rayless changes.

Taking the ratio of radium to uranium in minerals as $3{\cdot}4 \times 10^{-7}$, we get for the annual helium production per gram of uranium oxide, (U_3O_8) in a mineral, $9{\cdot}13 \times 10^{-8}$ c.c.

Adopting this rate of growth provisionally, the following ages are obtained *as a minimum* for some of the materials examined:—

	Years
Phosphatic nodules of the Crag	225,000
Phosphatic nodules of the Upper Greensand...	3,080,000
Phosphatic nodules of the Lower Greensand...	3,950,000
Hæmatite overlying Carboniferous Limestone	141,000,000

It must be emphasised that these absolute values are provisional only. It is hoped that geologists and others will not regard the method as discredited if it should be necessary to alter them considerably, when the rate of growth of helium has been directly determined.

The conclusions of this paper may be summarised as follows:—

(1) Phosphatic nodules and phosphatised bones of all geological ages possess marked radio-activity, many times higher than that of rocks. This activity is due to products of the uranium series.

(2) Helium has been detected in these materials, even when they are not of more than Pliocene age.

(3) The ratio of helium to uranium oxide has been measured. This ratio does not strictly follow the order of superposition of the strata; but high ratios are not met with in the younger deposits, whereas they are common in the older ones. It is conjectured that helium has been imperfectly retained, at all events in some cases.

(4) Provisional values are given for the time required to accumulate the quantity of helium now found in the nodules and other materials.

[1] Examples will be found in Roy. Soc. Proc., A, vol. lxxx., p. 573. The values are not reprinted here, as they were only obtained by the crude method of heating the minerals. This, however, suffices to give the order of magnitude.

PARIS.

Academy of Sciences, September 28.—M. Bouchard in the chair.—Two applications of Fredholm's equation to some problems of mathematical physics: Émile **Picard**. When a problem has been reduced to this equation it is usually sufficient to examine whether this is a singular case or not. In certain circumstances more complex conditions may arise; two simple examples of such cases are discussed in the present paper.—Experimental parthenogenesis by electrical charges: Yves **Delage**. The eggs are placed in a vessel the base of which forms one plate of an electrical condenser, and submitted to a series of charges. Blank experiments with the electrolytic solution

used proved conclusively that the latter alone, without the electric stimulation, could not cause the development of the eggs. With the electric charges the eggs developed to the larval stage. The possible causes of this action are discussed, and further experiments promised as regards the effect of the sign of the charge, the voltage, time of application, temperature, &c.—The relative stability of the polycarbonic cyclic groups: Louis **Henry.** In a previous paper the effect of dehydrating dimethyl-isopropyl-carbinol, $(CH_3)_2.C(OH).CH(CH_3)_2$, has been shown to give rise to two isomeric unsaturated hydrocarbons, tetramethylethylene and methyl-isopropylethylene. The dehydration of the closely related cyclic compound, dimethyl-cyclopropyl-carbinol, $\left.\begin{matrix}CH_2 \\ | \\ CH_2\end{matrix}\right> CH : C(OH)(CH_3)_2$, has now been studied. Acetic anhydride, which readily dehydrates the open-chain compound, transforms the cyclic compound into an acetate, no ethylene hydrocarbons being formed. It is necessary to use a more energetic dehydrating agent, phosphorus pentoxide, to produce the latter action. The action of potassium acetate upon the corresponding bromide gives the acetate instead of ethylene hydrocarbons, as with the open-chain compounds, the trimethylene derivative throughout showing the greater stability.—Systems of families of surfaces cutting along conjugated lines: S. **Carrus.**—Certain properties of curved surfaces: A. **Demoulin.**—The sixth geodetic campaign in the higher regions of the French Alps: Paul **Helbronner.** The atmospheric conditions were not so favourable as in the preceding year, but the remaining six points out of the thirty-two originally planned were determined. The second part of the work comprised the preparations for the triangulation in detail of Haute-Maurienne.—Wehnelt's interrupter: Paul **Bary.** The author develops a theory of the action of the Wehnelt contact breaker based on the production and condensation of vapours in narrow tubes under the action of the current. According to this view the action is not dependent on electrolytic action, but is rather analogous to a hydraulic ram or a pulsometer. The theory gives a good account of the experimental results.—The effects of *Oïdium quercinum* on different species of oaks: Ed. **Bureau.** The species are classified in three groups, those the leaves of which are refractory to the disease, those the younger leaves of which only are attacked, and those all of the leaves of which are attacked.—A seismograph registering electrically at a distance: B. **Galitzine.**

New South Wales.

Royal Society, August 5.—Mr. W. M. Hamlet, president, in the chair.—The pines of Australia, part i.: R. T. **Baker** and H. G. **Smith.** The Australian pines, Callitris, form a distinguishing feature of the landscape in various parts of the continent. In order to investigate their commercial possibilities, a research has been in progress now for same years at the museum, and during this period a very large amount of useful data has been accumulated which it is proposed to publish from time to time. In it is given a full account of the botany and chemistry of the "white or cypress pine," *Callitris glauca*, a species that has the largest geographical range of the genus, occurring in nearly all the States of Australia.—Contributions to the flora of Australia: Dr. A. J. **Ewart** and Miss Jean **White,** assisted by J. R. **Tovey.** The paper contains descriptions of new species and new varieties. It contains also some critical notes on rare and otherwise interesting plants, chiefly from Western Australia, and concludes with some records of introduced plants, together with notes on erroneous records of naturalised aliens.

Linnean Society, July 29.—Mr. J. H. Maiden vice-president, in the chair.—The genus Nannodythemis (Neuroptera: Odonata), with descriptions of new species: R. J. **Tillyard.** The type of this aberrant genus is *Nannodythemis australis*, Brauer. Two closely allied species, described in this paper, have now been discovered, one from West Australia and the other from the Blue Mountains.—Studies on Australian mollusca, part x.: C. **Hedley.** A series of co-types of rare and unfigured Australian shells was lent to the writer by the British Museum. With their help many difficult points in synonymy are now elucidated, and drawings are presented of a dozen hitherto unfigured shells, inadequate descriptions of which have troubled systematists for more than half a century.—The acidity of milk: Dr. H. G. **Chapman.** The acidity of milk determined within one minute of milking varies from 12° to 19°. The rate at which the acidity increases in milk upon standing was determined. For ten hours there is no increase. The acidity of many samples bought in Sydney was found to be between 12° and 20°. This acidity is not due to lactic acid, but to acid phosphate and dicaseinate.

August 29.—Mr. A. H. S. Lucas, president, in the chair.—Some Sydney desmids: G. I. **Playfair.**—The distribution, origin, and relationships of alkaline rocks: Dr. H. I. **Jensen.**—The alkaline petrographical province of eastern Australia: Dr. H. I. **Jensen.**

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